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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/590,079	08/21/2006	Takashi Goto	291650US0PCT	8078

22850 7590 10/27/2010

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EXAMINER	
RIPA, BRYAN D	
ART UNIT	PAPER NUMBER
1723	

NOTIFICATION DATE	DELIVERY MODE
10/27/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/590,079	GOTO ET AL.	
	Examiner	Art Unit	
	BRYAN D. RIPA	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 March 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,14,15 and 17-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,14,15 and 17-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on February 24, 2010 has been entered.

Response to Amendment

In response to the amendment received on March 23, 2010:

- claims 1,14,15 and 17-24 are presently pending
- all previous prior art rejections are withdrawn in light of the amendments to the claims
- new grounds of rejection are presented below

Claim Rejections - 35 USC § 102

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

1. Claims 1, 15, 17 and 22 are rejected under 35 U.S.C. 102(b) as being anticipated by Ueno et al., (U.S. Pub. No. 2003/0026921) (hereinafter referred to as "UENO") with evidence from Gruen et al., (U.S. Pub. No. 2004/0129202) (hereinafter referred to as "GRUEN"), Lian et al., "Ru-Doped Nanostructured Carbon Films" *Diamond and Related Materials* 11, pages 1890-1896 (2002) (hereinafter referred to as "LIAN"), and "The Element Carbon" accessed from http://education.jlab.org/itselemental/ele006.html on September 15, 2010 (hereinafter referred to as "CARBON REF").

Regarding claim 1, UENO teaches a particle-dispersed complex (see generally ¶4) comprising:

- a matrix having carbon as a main component (see ¶45 teaching the matrix surrounding the ruthenium clusters comprising exclusively carbon);
- metallic ruthenium particles dispersed in and surrounded by the matrix (see ¶45 and ¶80 teaching the ruthenium metal clusters embedded and encapsulated by the carbon matrix);
- wherein each of the particles has a particle diameter in a range of from 5 to 100 nm (see ¶45 teaching the size of the ruthenium clusters being 5 nm); and
- every part of the entire surface of each of the particles makes contact with either the matrix or another of the particles (see ¶45 teaching the formation of a diamond like carbon film with ruthenium metal clusters embedded in the carbon matrix; see also ¶80 teaching the ruthenium nanoclusters being encapsulated

within the carbon matrix; see also discussion below regarding GRUEN and LIAN); and

- the matrix is carbon black (see ¶9 teaching the disclosed film comprising a metal-doped amorphous carbon film; see also CARBON REF teaching that carbon black is an amorphous form of carbon and as used by the Applicant are synonymous).

Moreover, GRUEN and LIAN provide further evidence that the ruthenium encapsulated carbon film of UENO would be non-porous, i.e. that the metallic ruthenium particles inside the carbon matrix would be completely encapsulated by either the carbon matrix or other ruthenium particles as claimed.

Specifically, LIAN teaches the production of a diamond like carbon film by a similar process to UENO where the addition of ruthenium to the film resulted in the diamond nanocrystals that were formed having an average size of 3 nm (see page 1892).

Furthermore, GRUEN teaches that a diamond-like carbon film having diamond nanocrystals of about 3 to 5 nm in size is non-porous (see ¶65 and ¶35 teaching the ultra-nanocrystalline diamond, i.e. diamond nanocrystals of about 3 to 5 nm, being non-porous).

Additionally, UENO teaches the deposited film possessing diamond-like sp^3 carbon structure (see ¶45). However, the Examiner is of the opinion that the sp^3 carbon structure referred to is not describing the entire carbon structure but rather specific portions or sites within the carbon film. Were this not so, the film could not be said to

have any amorphous qualities since amorphous carbon by definition lacks diamond-like crystallinity (see ¶9 teaching the disclosed film comprising a metal-doped amorphous carbon film).

This view is further supported by LIAN that teaches that ruthenium-doped carbon films formed by CVD processes have been known to have some proportion of sp^3 or diamond-like structures or, in some cases, none at all (see page 1895 and discussion relating to table 1). LIAN also teaches that ruthenium-doped nanocrystalline diamond films, while they contained ruthenium and diamond-like nanocrystalline grains (see page 1892 first paragraph under the "Results and Discussion" section), comprised the nanocrystallites within an amorphous carbon matrix (see page 1896 first paragraph). As such, LIAN provides further support for the interpretation of UENO such that the carbon film formed in the CVD process of UENO results in a film having an amorphous carbon matrix that surrounds the ruthenium and any diamond-like crystals that may have formed.

Please note, the Examiner is interpreting the limitation requiring "the matrix is carbon black" as merely requiring the presence of carbon black and not the matrix being exclusively carbon black. Additionally, as shown by the CARBON REF, the Examiner is interpreting carbon black as synonymous with amorphous carbon.

Regarding claim 15, UENO teaches the particle-dispersed complex wherein the matrix is deposited by a CVD method (see ¶10 and ¶80).

Please note, the claim limitations reciting the substrate temperature and oxygen concentration of the carrier gas are being treated as product-by-process claim limitations. See MPEP § 2113. The cited prior art, as denoted above, teaches all of the positively recited structure of the claimed product. The patentability of a product or apparatus does not depend on its method of production or formation. Moreover, if the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. See *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985) (see MPEP § 2113).

Furthermore, while claim 15 is directed to the process parameters employing a slightly different type of metalorganic chemical vapor deposition or MOCVD, the process of UENO also employs a MOCVD process albeit one that employs plasma to enhance the deposition (see ¶80). Additionally, the layers deposited by each of the processes appears to have a similar structure, i.e. nanometer sized ruthenium particles deposited in a highly dense or non-porous carbon matrix.

Regarding claim 17, UENO teaches the particle-dispersed complex wherein the complex is held on an electrically conductive substrate (see ¶11 teaching the biasing of the substrate; see also ¶45 teaching the use of a silicon substrate).

Regarding claim 22, UENO teaches the particle-dispersed complex wherein the complex is an electrochemical catalyst (see ¶6, ¶10 and ¶45 teaching the formation of ruthenium nano-particles in the film which are known to be an electrochemical catalyst).

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over UENO as applied to claim 1 above, and further with evidence from LIAN.

Regarding claim 14, UENO does not explicitly teach the atomic number ratio of carbon to ruthenium in the particle-dispersed complex.

However, as evidenced by LIAN, it was known in the art that the addition of ruthenium affected the size of the diamond nanocrystals that were formed (see page 1892). Furthermore, LIAN also evidences the fact that it was known in the art that the addition of metals to the diamond-like carbon films enhanced the electrical conductivity, electrochemical activity and the adhesion of the resulting film (see page 1890).

Consequently, it would have been obvious to one of ordinary skill in the art to adjust the atom percent of the metal in the carbon film in order to achieve the desired properties for a given application.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to adjust the atom percent of carbon to ruthenium as claimed.

3. Claims 18-21, 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over UENO as applied to claim 1 above, and further in view of GOTO with evidence from Suzuki et al., (U.S. Pat. No. 5,814,719) (hereinafter referred to as "SUZUKI").

Regarding claim 18, while UENO does disclose the use of the carbon film as an electrode for electrochemical applications (see ¶6), UENO does not explicitly teach the particle-dispersed complex wherein the complex is formed on a solid electrolyte substrate.

However, GOTO teaches the use of an iridium-carbon film having nanometer sized iridium clusters that was deposited on a solid electrolyte substrate for use as a catalytic electrode (see page 1187).

Furthermore, although GOTO specifically discloses the use of iridium, GOTO teaches the use of carbon films with noble metal nanoparticles more generally for possible use as catalytic electrodes for solid electrolytes (see page 1187). Additionally, GOTO teaches that the use of an iridium carbon electrode results in an electrode well suited for use with a solid electrolyte (see page 1188 teaching the electrode formed of the iridium carbon film being both highly reversible and catalytic). Moreover, as evidenced by SUZUKI, it is well known in the art and common to use noble metals such

as platinum, palladium, iridium and ruthenium interchangeably as catalytic materials for incorporation into solid electrolyte sensors. As a result, one of ordinary skill in the art would have understood the teachings of GOTO to apply to the use of more than solely an iridium-carbon film for use as an electrode.

Furthermore, based on the benefits attained by the use of iridium over platinum as shown by GOTO, one of ordinary skill in the art would have been motivated to attempt to use other catalytic metals commonly used in the art for alternatives to iridium that are even better suited for use as an electrode for solid electrolyte applications.

Consequently, it would have been obvious to one of ordinary skill in the art at the time of invention to incorporate the teachings of GOTO, including the use of a catalytic metal containing carbon film as an electrode on a solid electrolyte, with the ruthenium containing carbon film of UENO for use as an electrode as claimed.

Regarding claim 19, UENO as modified by GOTO teaches the particle-dispersed complex of claims 1 and 18. Consequently, the film would inherently possess the same interfacial electrical conductivity to that as claimed. MPEP § 2112. See also In re Best, 562 F.2d 1252, 1254, 195 USPQ 430, 433 (CCPA 1977).

Regarding claims 20, 21 and 24, GOTO teaches the solid electrolyte substrate being a zirconium oxide substrate which includes a stabilizing agent (see page 1187 teaching the use of yttria stabilized zirconia as the solid electrolyte substrate). Moreover, as discussed above with respect to the rejection of claim 18, it would have

been obvious to use the film deposited on the solid electrolyte substrate as an electrode for use in a solid electrolyte sensor.

Regarding claim 23, UENO teaches the particle-dispersed complex wherein the complex is an electrochemical catalyst (see ¶6, ¶10 and ¶45 teaching the formation of ruthenium nano-particles in the film which are known to be an electrochemical catalyst).

Response to Arguments

Applicant's arguments with respect to claims 1, 14, 15 and 17-24 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRYAN D. RIPA whose telephone number is 571-270-7875. The examiner can normally be reached on Monday to Friday, 9:00 AM to 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Harry D Wilkins, III/
Primary Examiner, Art Unit 1723

/B. D. R./
Examiner, Art Unit 1723